FIG. 1

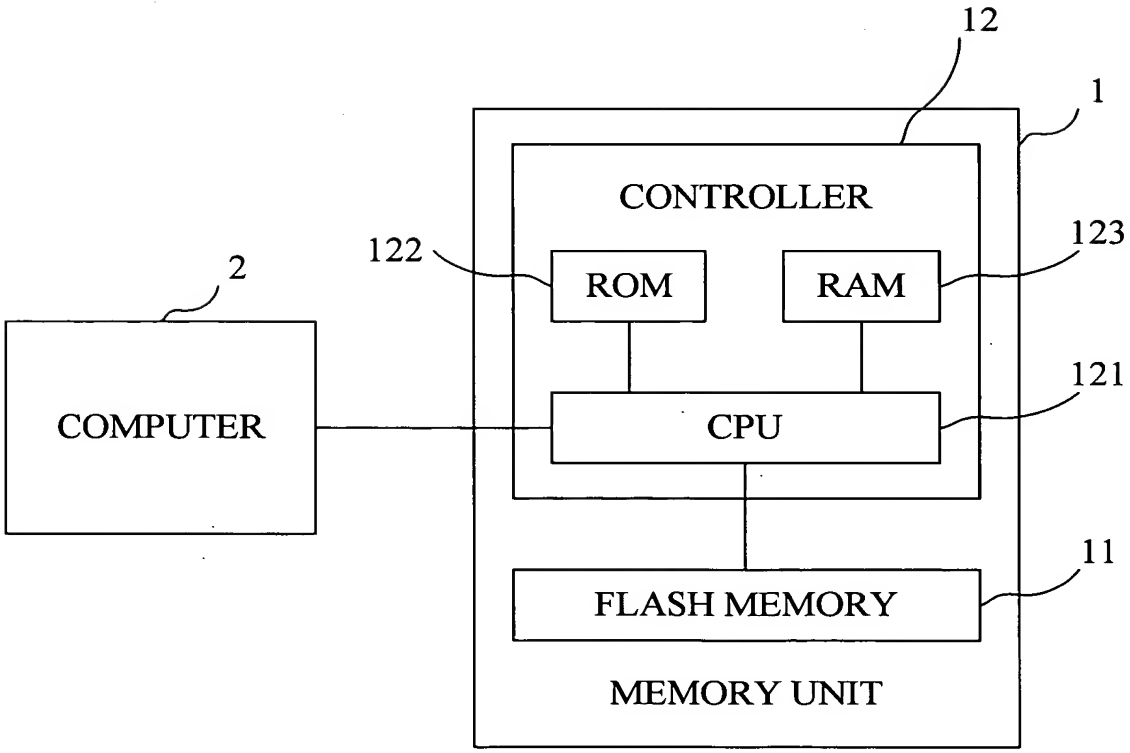

12
1
CONTROLLER
122
123
2
ROM
RAM
COMPUTER
121
CPU
11
FLASH MEMORY
MEMORY UNIT

FIG. 2

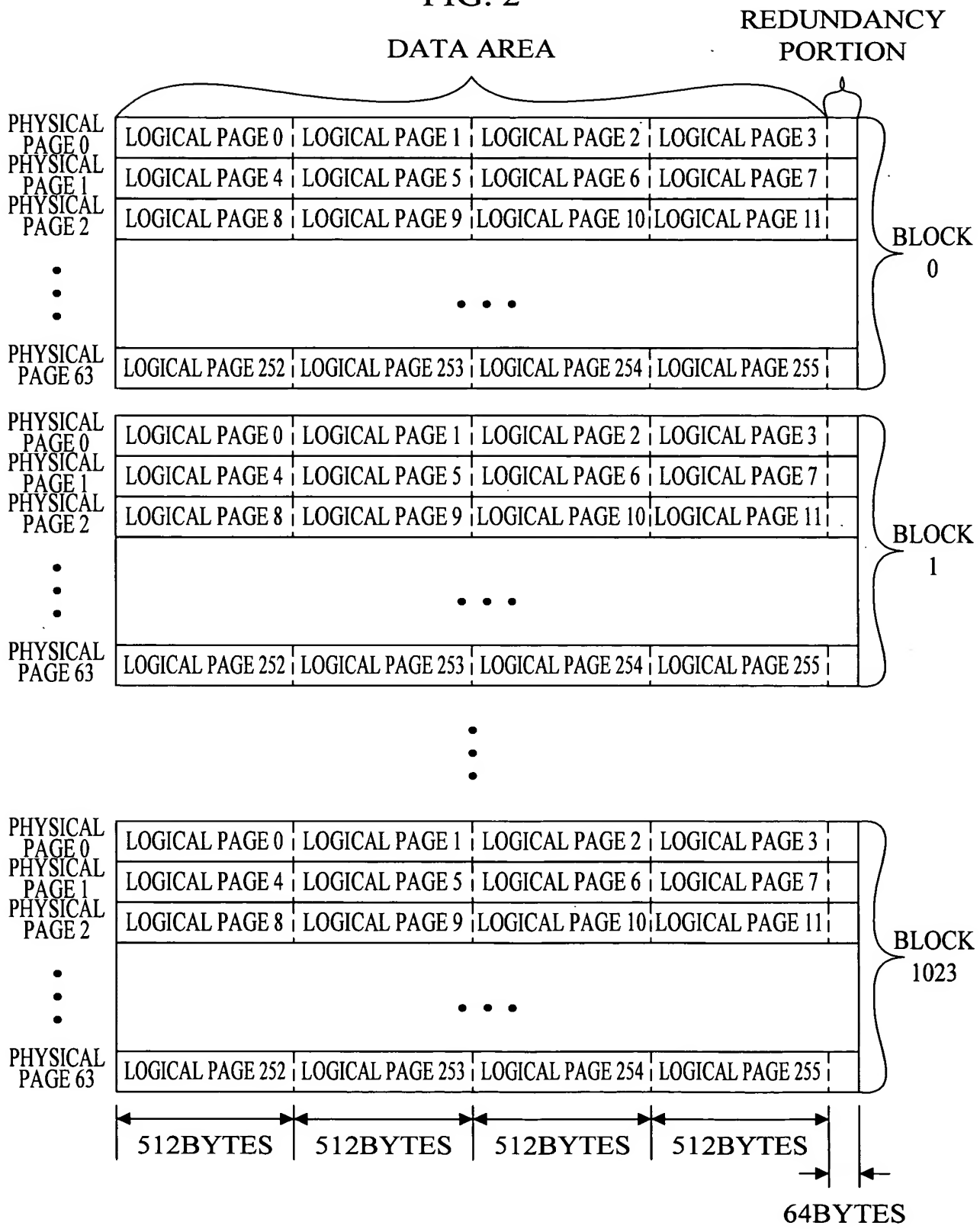

DATA AREA
REDUNDANCY PORTION
PHYSICAL PAGE 0
PHYSICAL PAGE 1
PHYSICAL PAGE 2
PHYSICAL PAGE 63
LOGICAL PAGE 0
LOGICAL PAGE 1
LOGICAL PAGE 2
LOGICAL PAGE 3
LOGICAL PAGE 4
LOGICAL PAGE 5
LOGICAL PAGE 6
LOGICAL PAGE 7
LOGICAL PAGE 8
LOGICAL PAGE 9
LOGICAL PAGE 10
LOGICAL PAGE 11
LOGICAL PAGE 252
LOGICAL PAGE 253
LOGICAL PAGE 254
LOGICAL PAGE 255
BLOCK 0
BLOCK 1
BLOCK 1023
512BYTES
512BYTES
512BYTES
512BYTES
64BYTES

FIG. 3

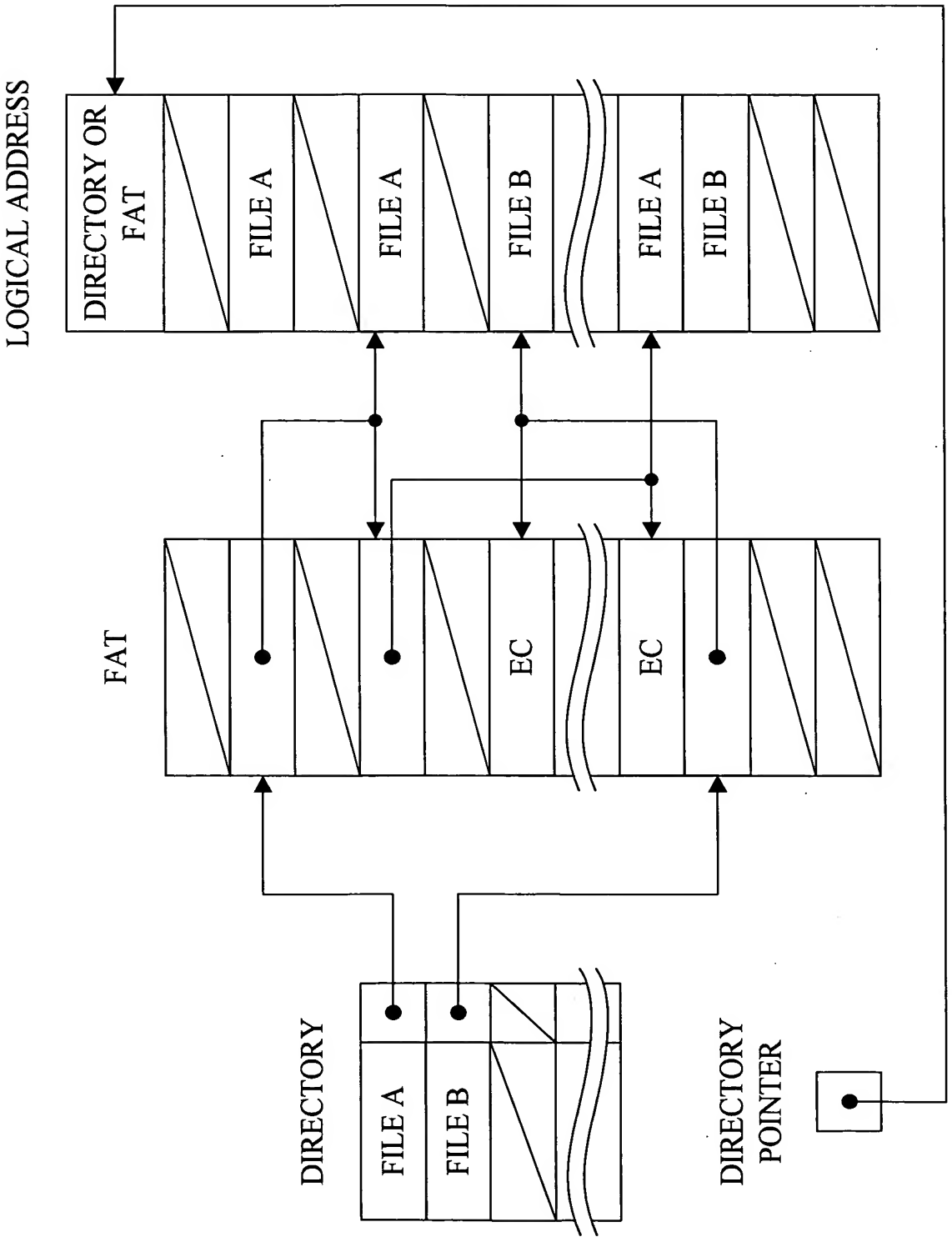

LOGICAL ADDRESS
DIRECTORY OR FAT
FILE A
FILE A
FILE B
FILE A
FILE B
FAT
EC
EC
DIRECTORY
FILE A
FILE B
DIRECTORY POINTER

FIG. 4

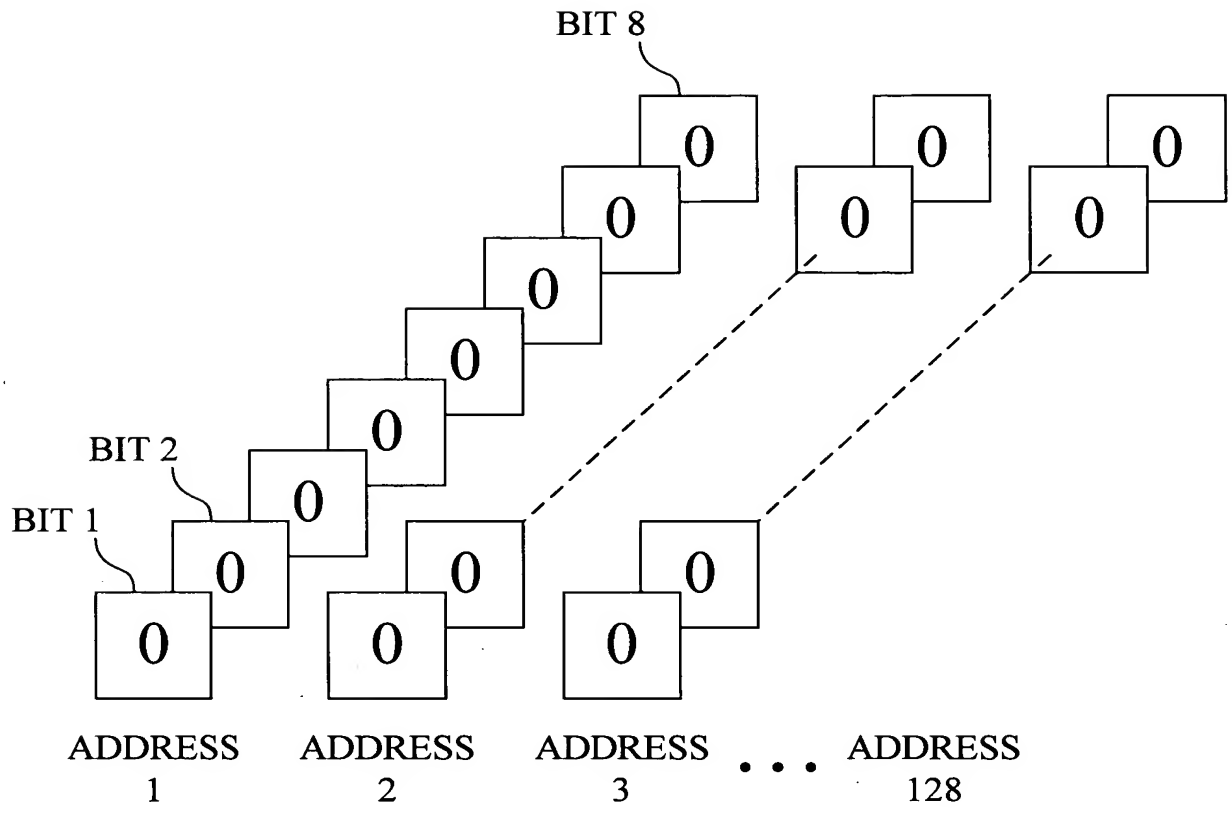
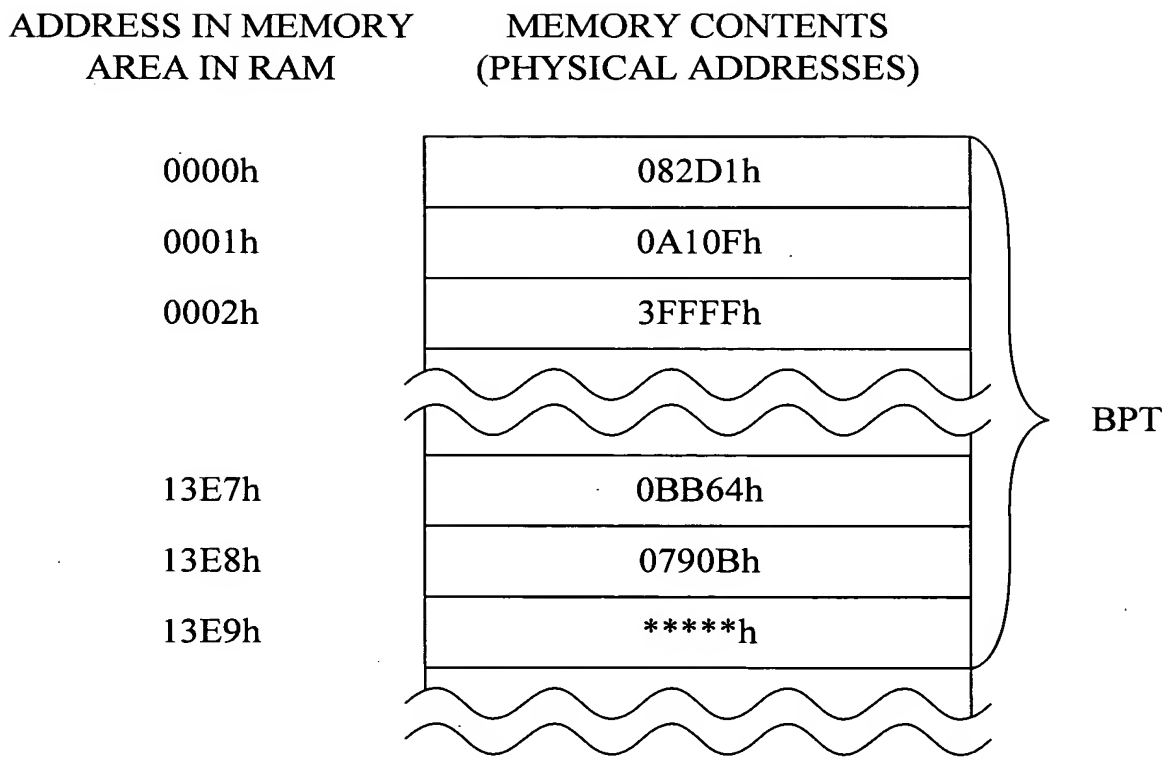


FIG. 5



(ADDRESS IN MEMORY AREA IN RAM TO STORE BPT)
= (LOGICAL ADDRESS) - OFFSET VALUE

FIG. 6

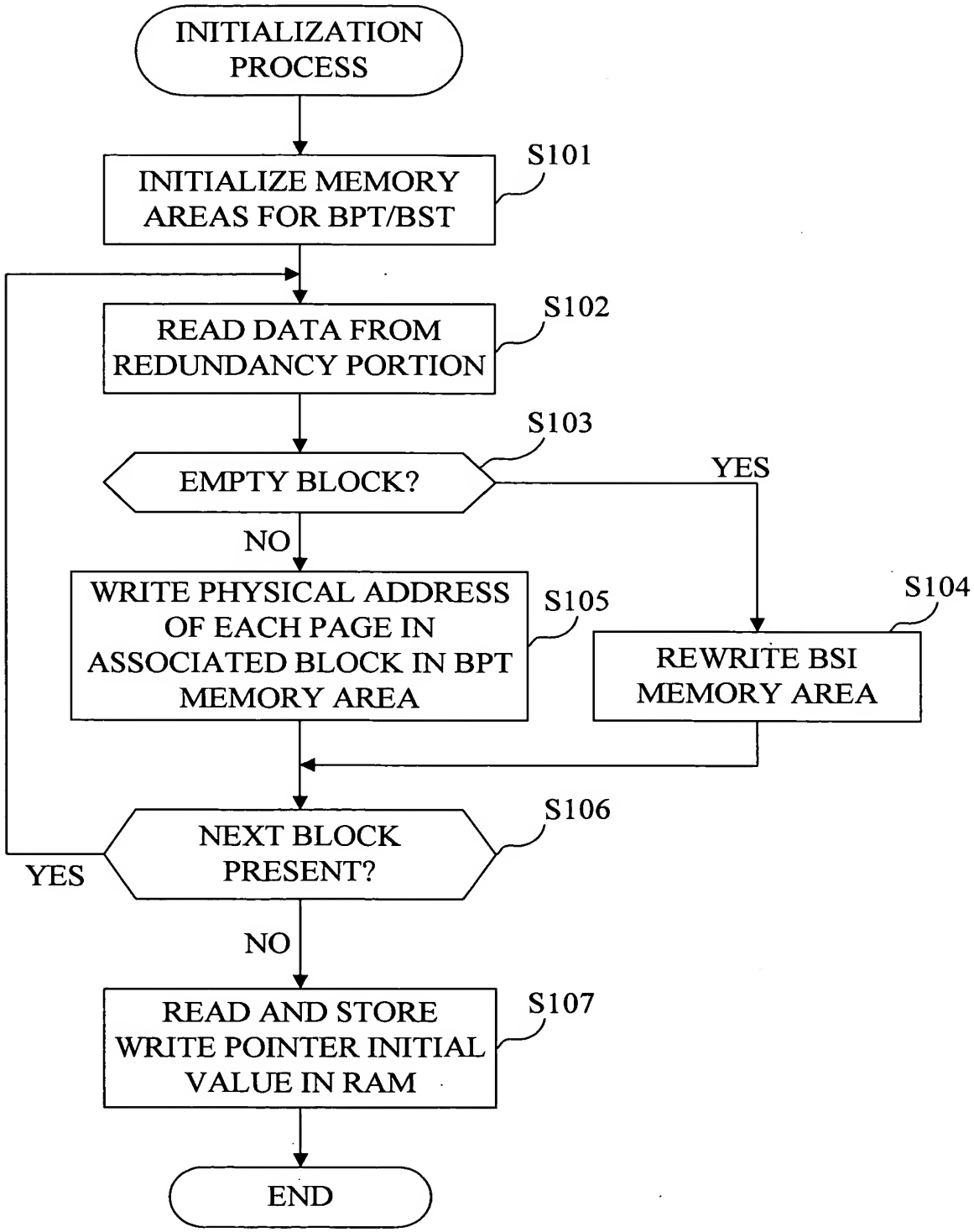

INITIALIZATION PROCESS
INITIALIZE MEMORY AREAS FOR BPT/BST
S101
READ DATA FROM REDUNDANCY PORTION
S102
EMPTY BLOCK?
S103
YES
NO
WRITE PHYSICAL ADDRESS OF EACH PAGE IN ASSOCIATED BLOCK IN BPT MEMORY AREA
S105
REWRITE BSI MEMORY AREA
S104
NEXT BLOCK PRESENT?
S106
YES
NO
READ AND STORE WRITE POINTER INITIAL VALUE IN RAM
S107
END

FIG. 7

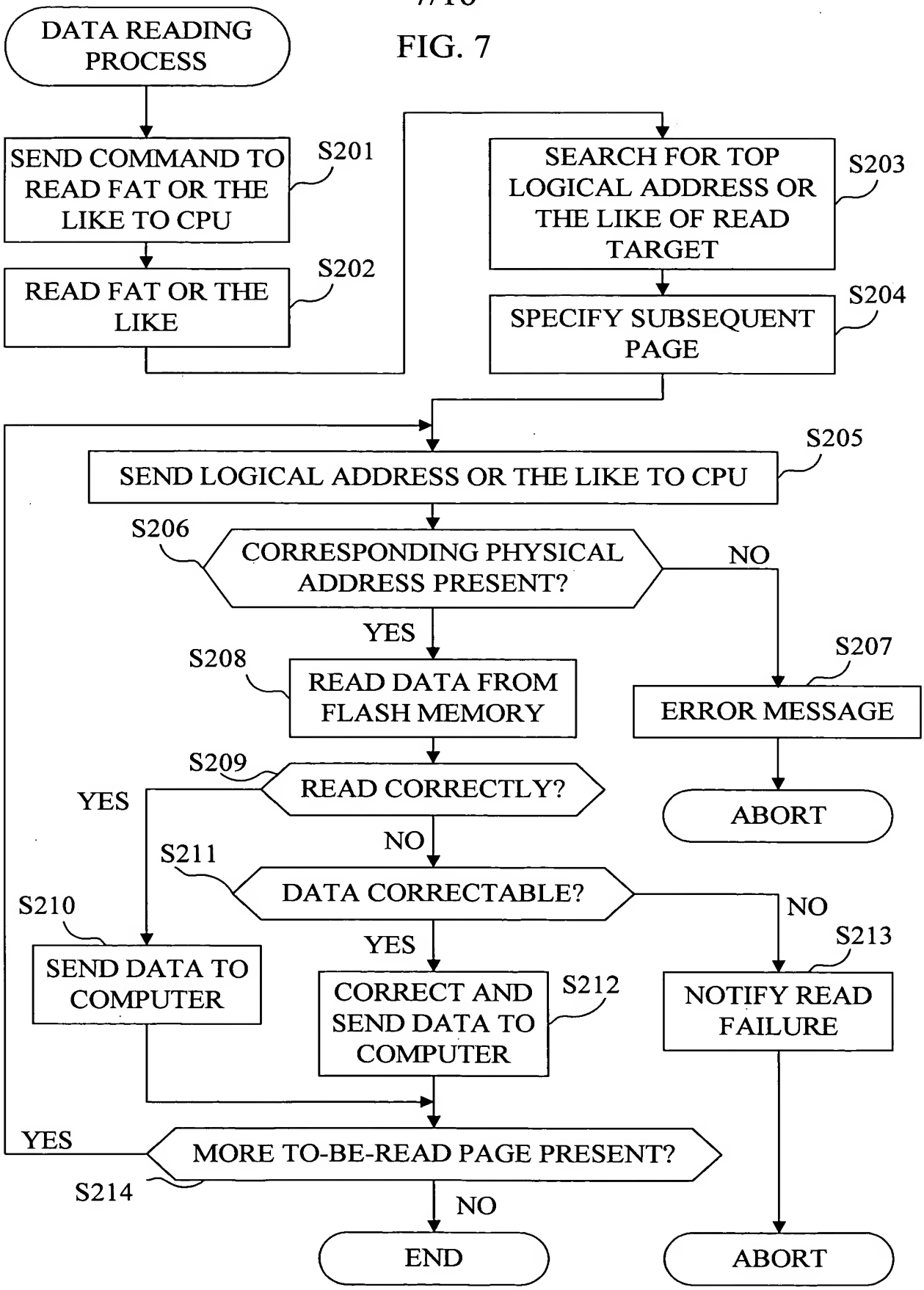

DATA READING PROCESS
SEND COMMAND TO READ FAT OR THE LIKE TO CPU
S201
READ FAT OR THE LIKE
S202
SEARCH FOR TOP LOGICAL ADDRESS OR THE LIKE OF READ TARGET
S203
SPECIFY SUBSEQUENT PAGE
S204
SEND LOGICAL ADDRESS OR THE LIKE TO CPU
S205
S206
CORRESPONDING PHYSICAL ADDRESS PRESENT?
NO
YES
S207
ERROR MESSAGE
ABORT
S208
READ DATA FROM FLASH MEMORY
S209
READ CORRECTLY?
YES
NO
S211
DATA CORRECTABLE?
NO
YES
S210
SEND DATA TO COMPUTER
S212
CORRECT AND SEND DATA TO COMPUTER
S213
NOTIFY READ FAILURE
YES
MORE TO-BE-READ PAGE PRESENT?
S214
NO
END
ABORT

FIG. 8

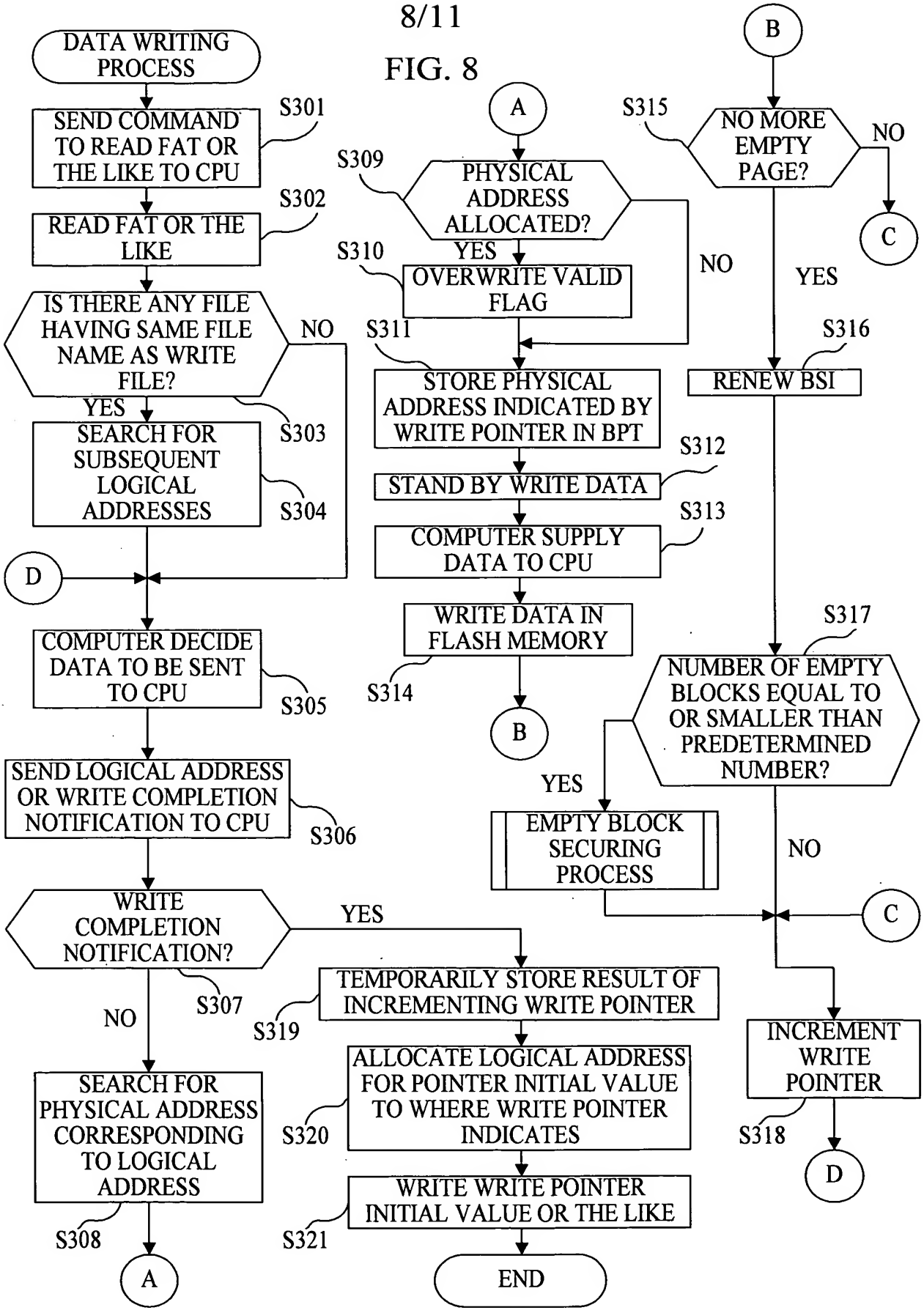

DATA WRITING PROCESS
SEND COMMAND TO READ FAT OR THE LIKE TO CPU
S301
READ FAT OR THE LIKE
S302
IS THERE ANY FILE HAVING SAME FILE NAME AS WRITE FILE?
NO
YES
S303
SEARCH FOR SUBSEQUENT LOGICAL ADDRESSES
S304
D
COMPUTER DECIDE DATA TO BE SENT TO CPU
S305
SEND LOGICAL ADDRESS OR WRITE COMPLETION NOTIFICATION TO CPU
S306
WRITE COMPLETION NOTIFICATION?
YES
S307
NO
SEARCH FOR PHYSICAL ADDRESS CORRESPONDING TO LOGICAL ADDRESS
S308
A
A
S309
PHYSICAL ADDRESS ALLOCATED?
YES
NO
S310
OVERWRITE VALID FLAG
S311
STORE PHYSICAL ADDRESS INDICATED BY WRITE POINTER IN BPT
S312
STAND BY WRITE DATA
S313
COMPUTER SUPPLY DATA TO CPU
WRITE DATA IN FLASH MEMORY
S314
B
B
S315
NO MORE EMPTY PAGE?
NO
YES
C
S316
RENEW BSI
S317
NUMBER OF EMPTY BLOCKS EQUAL TO OR SMALLER THAN PREDETERMINED NUMBER?
YES
EMPTY BLOCK SECURING PROCESS
NO
C
INCREMENT WRITE POINTER
S318
D
S319
TEMPORARILY STORE RESULT OF INCREMENTING WRITE POINTER
S320
ALLOCATE LOGICAL ADDRESS FOR POINTER INITIAL VALUE TO WHERE WRITE POINTER INDICATES
S321
WRITE WRITE POINTER INITIAL VALUE OR THE LIKE
END

FIG. 9

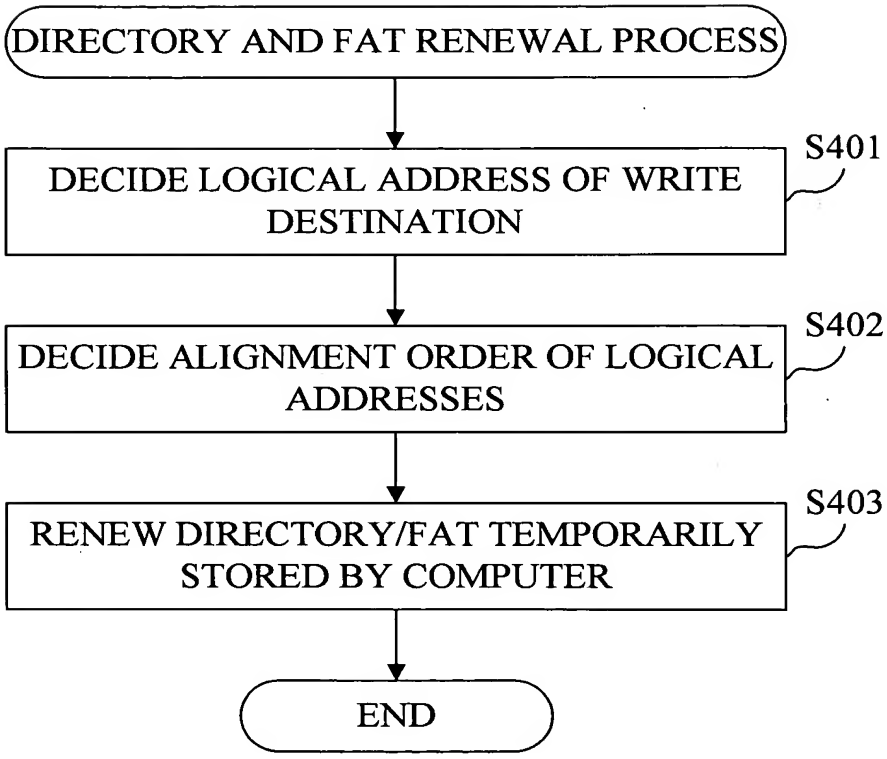

DIRECTORY AND FAT RENEWAL PROCESS
DECIDE LOGICAL ADDRESS OF WRITE DESTINATION
S401
DECIDE ALIGNMENT ORDER OF LOGICAL ADDRESSES
S402
RENEW DIRECTORY/FAT TEMPORARILY STORED BY COMPUTER
S403
END

FIG. 10

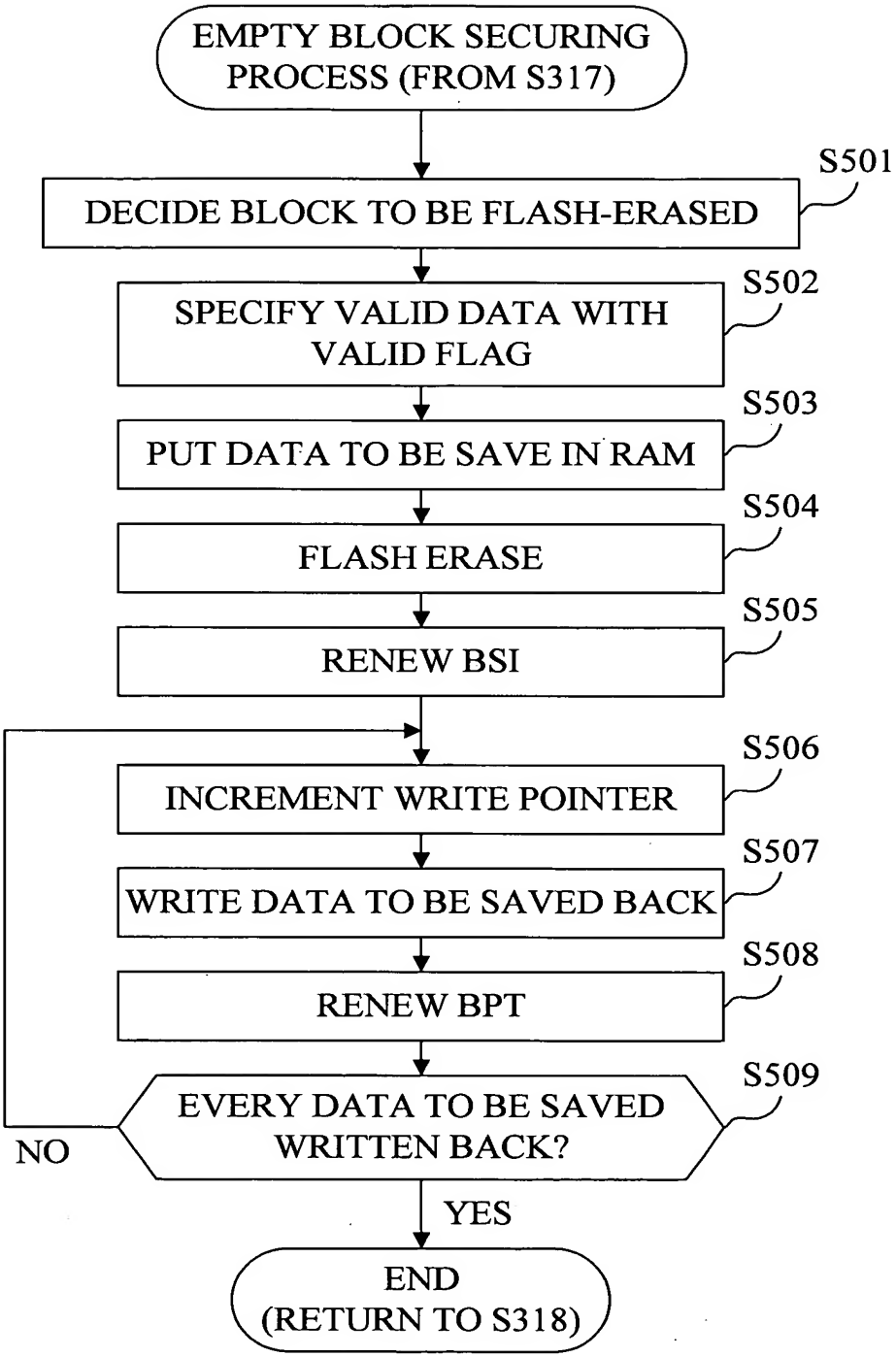
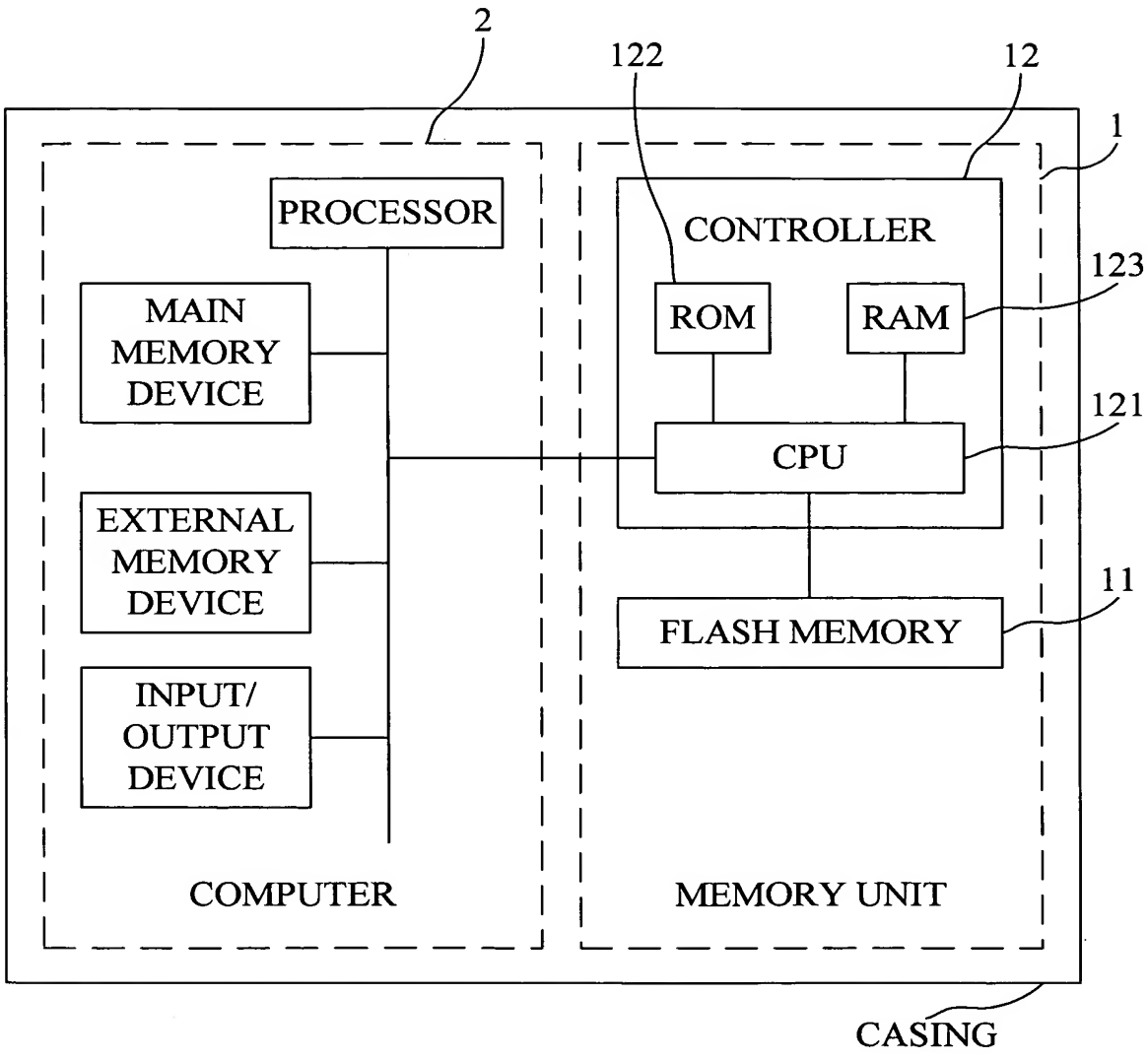

EMPTY BLOCK SECURING PROCESS (FROM S317)
S501
DECIDE BLOCK TO BE FLASH-ERASED
S502
SPECIFY VALID DATA WITH VALID FLAG
S503
PUT DATA TO BE SAVE IN RAM
S504
FLASH ERASE
S505
RENEW BSI
S506
INCREMENT WRITE POINTER
S507
WRITE DATA TO BE SAVED BACK
S508
RENEW BPT
S509
EVERY DATA TO BE SAVED WRITTEN BACK?
NO
YES
END (RETURN TO S318)

FIG. 11


2
122
12
1
PROCESSOR
CONTROLLER
123
MAIN MEMORY DEVICE
ROM
RAM
121
CPU
EXTERNAL MEMORY DEVICE
11
FLASH MEMORY
INPUT/ OUTPUT DEVICE
COMPUTER
MEMORY UNIT
CASING